BURNS, DOANE, SWECKER AND MATHIS LLP
[redacted]LN. FILING DATE: APRIL 25, 2001
[redacted]LE: APPARATUS AND METHOD FOR DETECT[redacted]..
ATTORNEY DOCKET NO: 018775-824 19 SHEETS

Fig.1

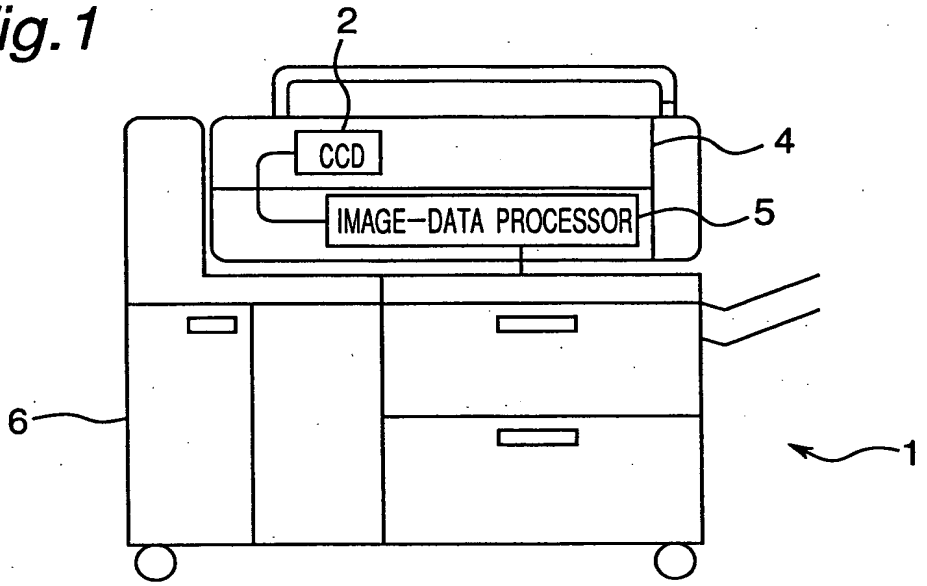

Fig.2

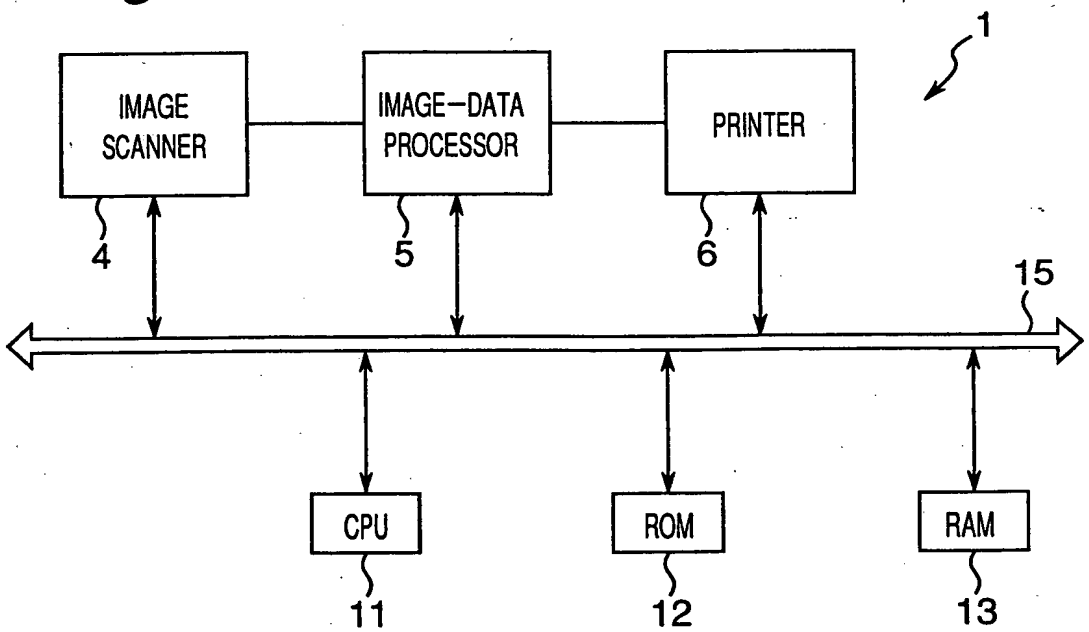

Fig.3

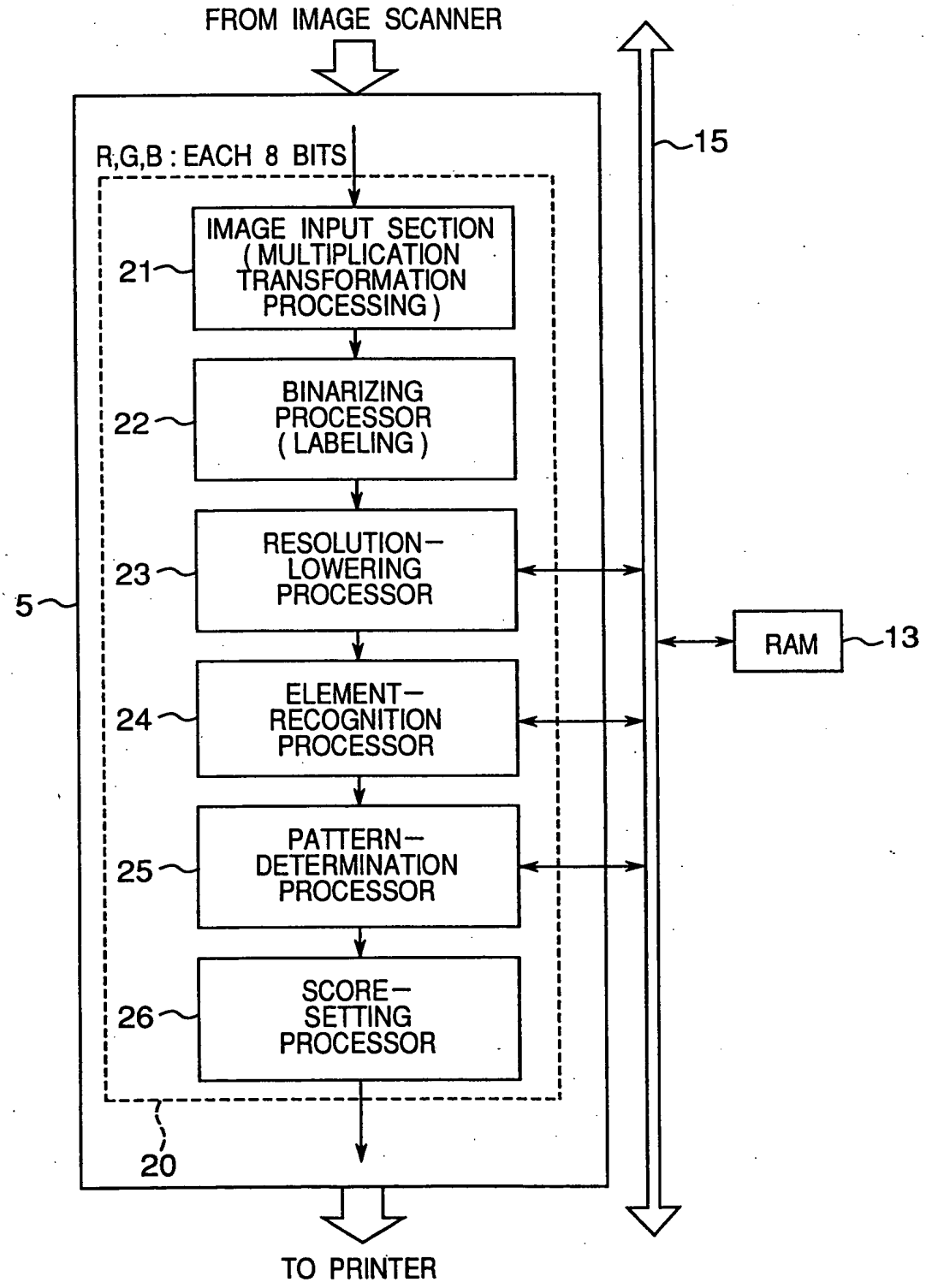
FROM IMAGE SCANNER
R,G,B : EACH 8 BITS
IMAGE INPUT SECTION (MULTIPLICATION TRANSFORMATION PROCESSING)
21
BINARIZING PROCESSOR (LABELING)
22
RESOLUTION-LOWERING PROCESSOR
23
ELEMENT-RECOGNITION PROCESSOR
24
PATTERN-DETERMINATION PROCESSOR
25
SCORE-SETTING PROCESSOR
26
20
5
15
RAM
13
TO PRINTER

Fig.4

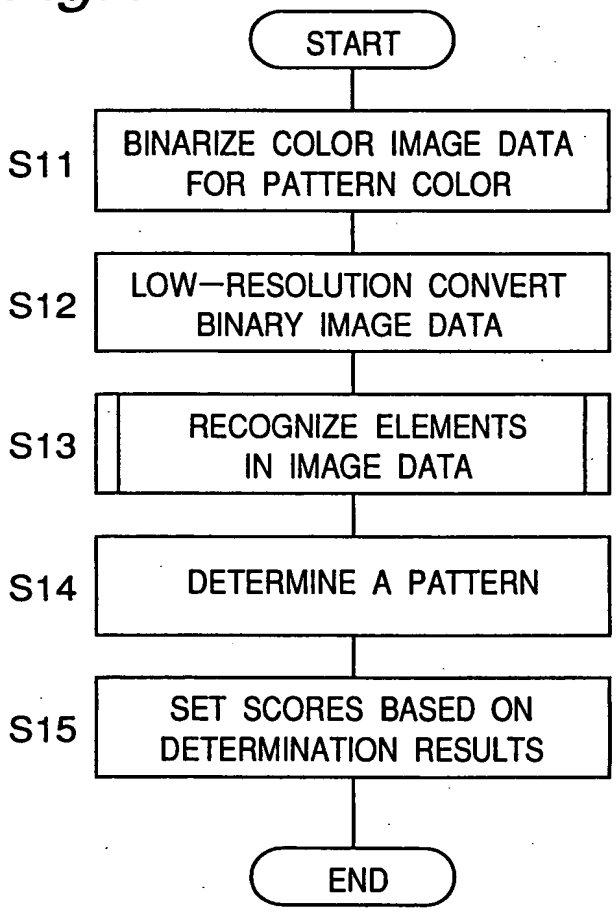
START
S11
BINARIZE COLOR IMAGE DATA FOR PATTERN COLOR
S12
LOW-RESOLUTION CONVERT BINARY IMAGE DATA
S13
RECOGNIZE ELEMENTS IN IMAGE DATA
S14
DETERMINE A PATTERN
S15
SET SCORES BASED ON DETERMINATION RESULTS
END

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Fig.5

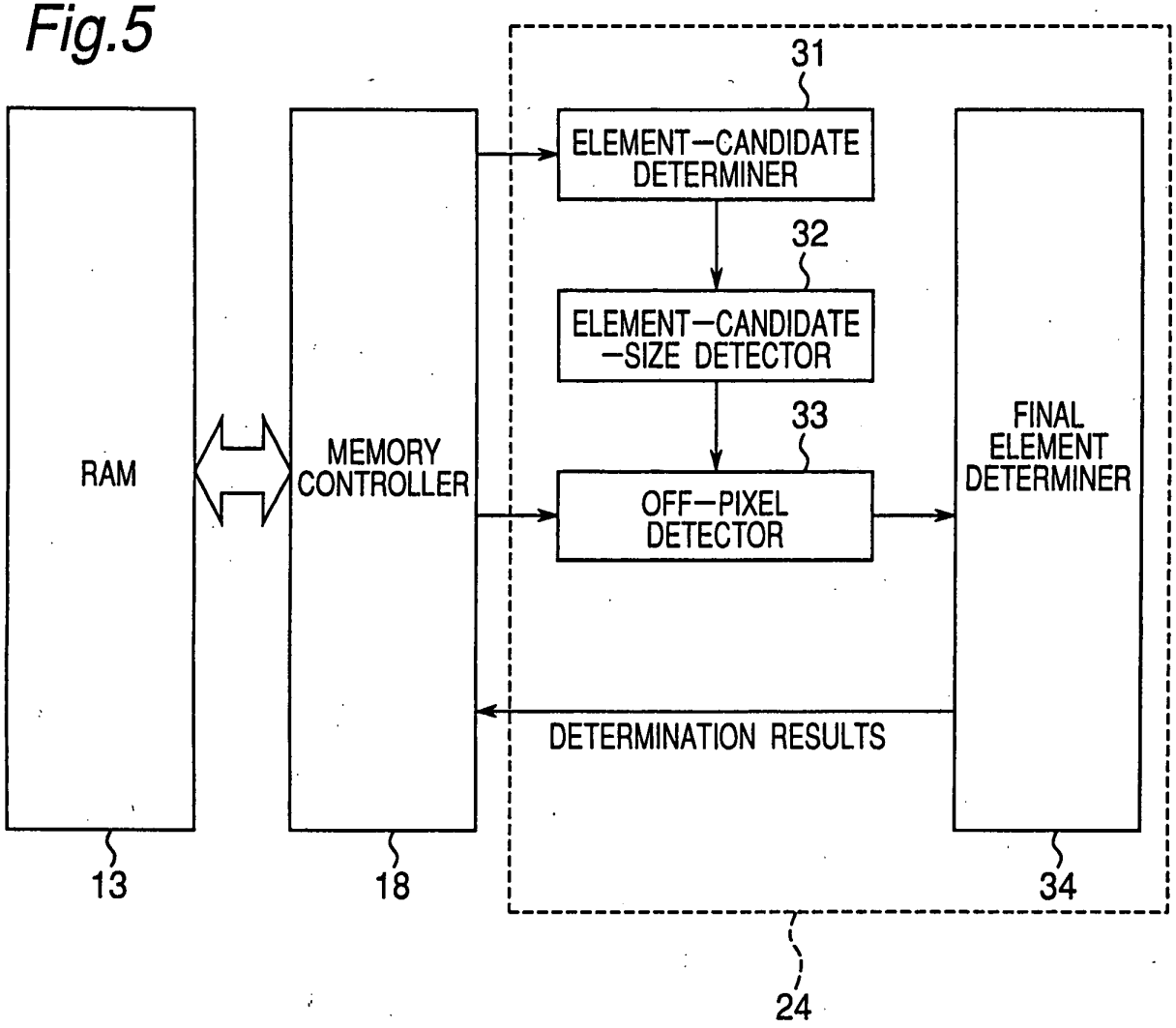
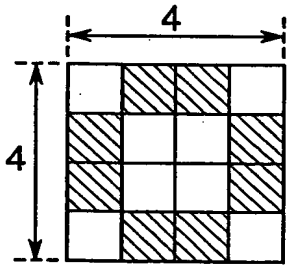
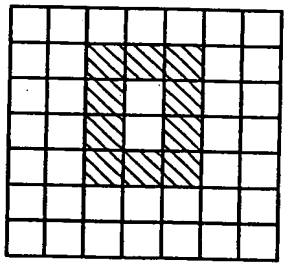


Fig.6



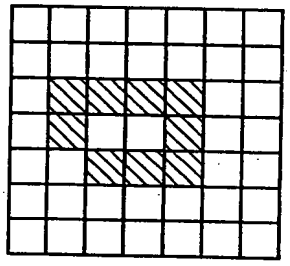
EXAMPLES OF OK

Fig.7A



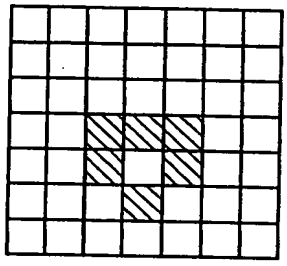
NUMBER OF ON—PIXELS : 10
SIZE : 3X4

Fig.7B



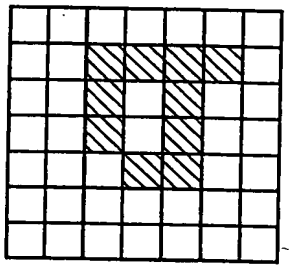
NUMBER OF ON—PIXELS : 9
SIZE : 4X3

Fig.7C



NUMBER OF ON—PIXELS : 6
SIZE : 3X3

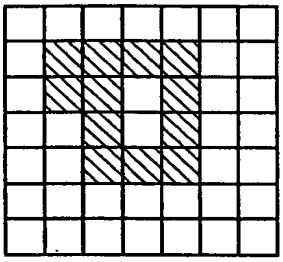
Fig.7D



NUMBER OF ON—PIXELS : 10
SIZE : 4X4

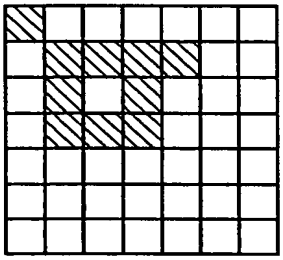
EXAMPLES OF NG

Fig.8A



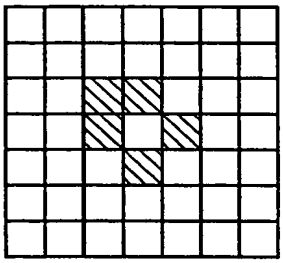
NUMBER OF ON−PIXELS : 12
SIZE : 4X4

Fig.8B



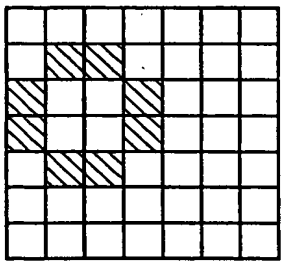
NUMBER OF ON−PIXELS : 10
SIZE : 5X4

Fig.8C



NUMBER OF ON−PIXELS : 5
SIZE : 3X3

Fig.8D



NUMBER OF ON−PIXELS : 8
SIZE : 4X4

EP 0 954 168 A2

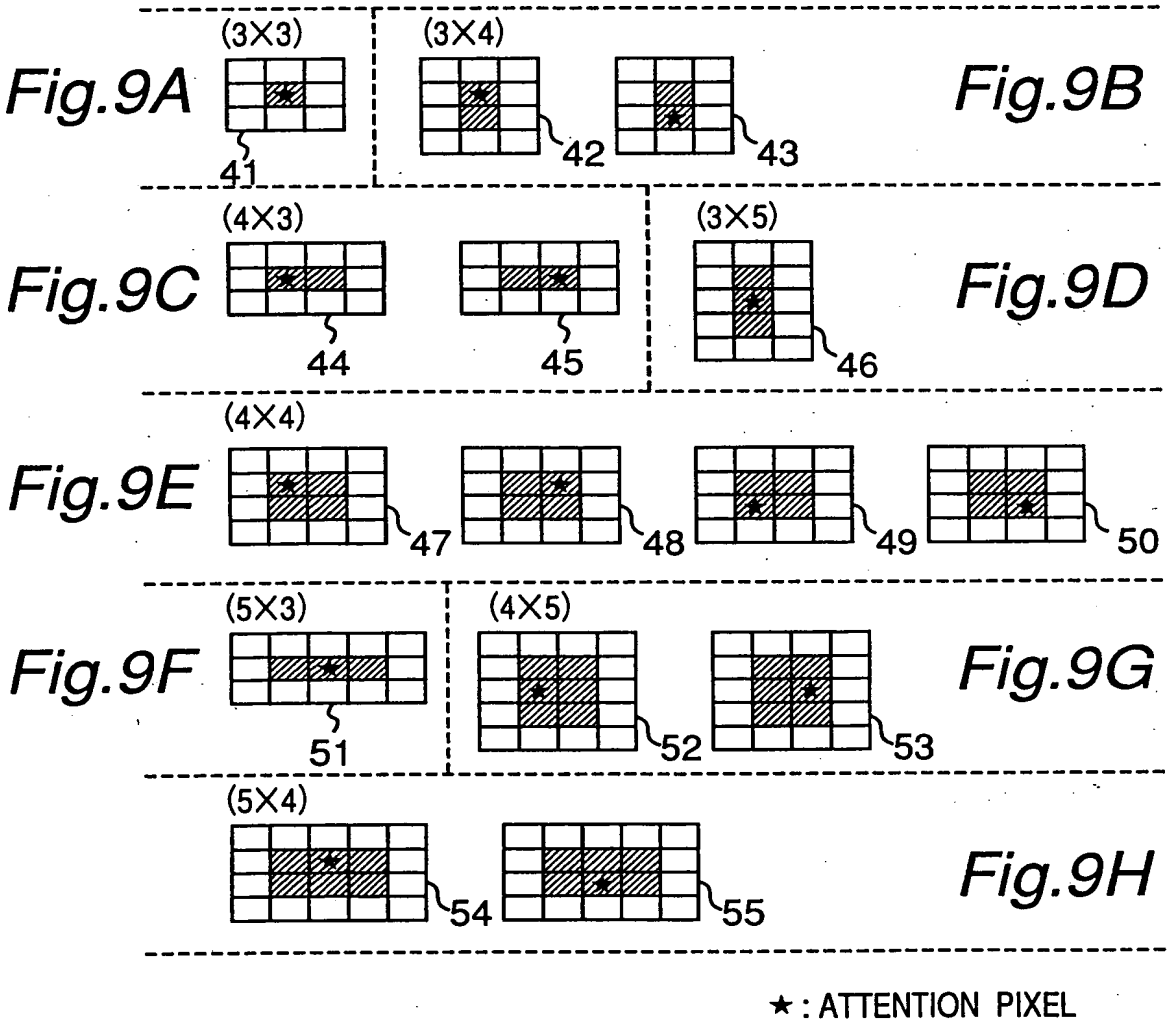
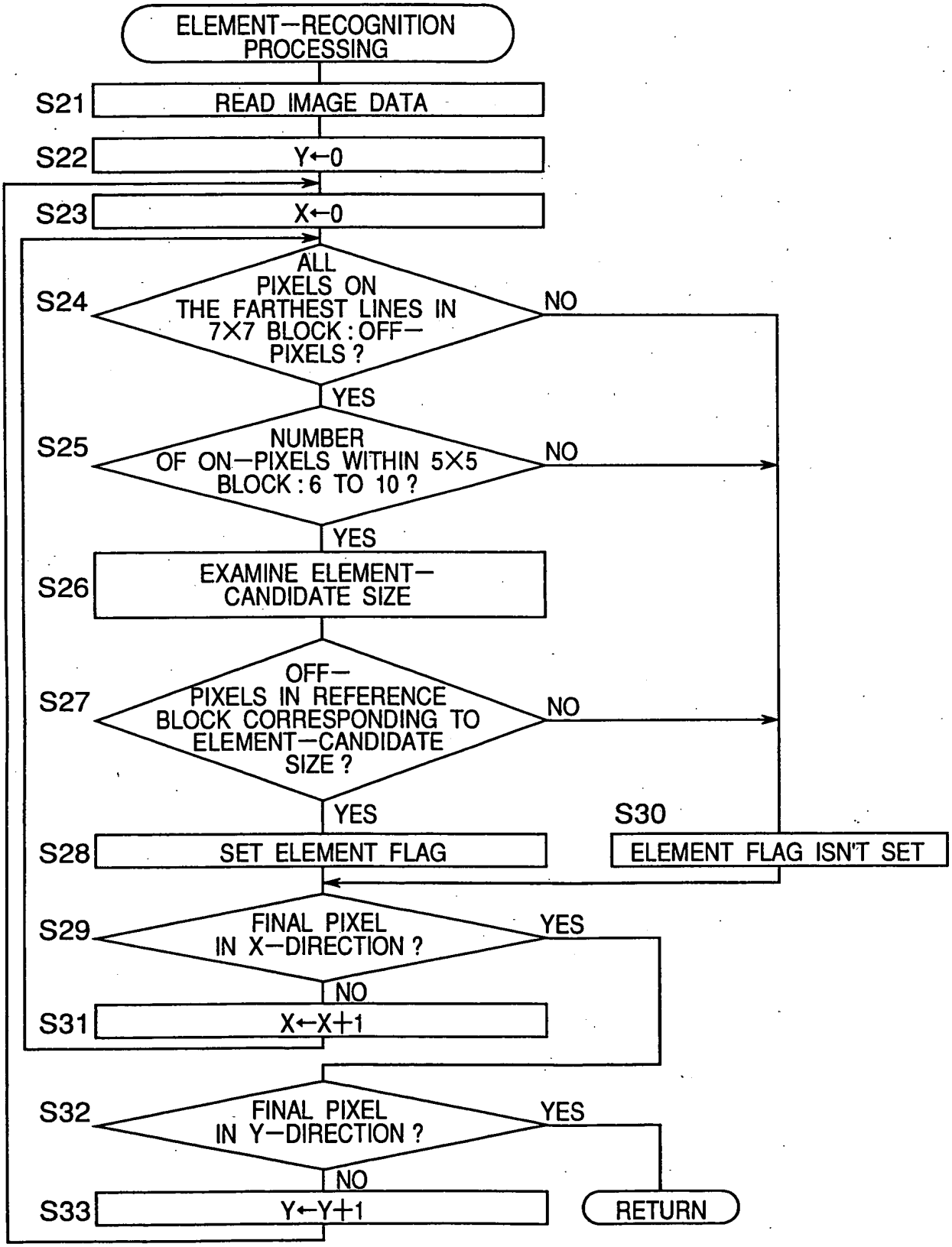


Fig.9A
(3X3)
41
Fig.9B
(3X4)
42
43
Fig.9C
(4X3)
44
45
Fig.9D
(3X5)
46
Fig.9E
(4X4)
47
48
49
50
Fig.9F
(5X3)
51
Fig.9G
(4X5)
52
53
Fig.9H
(5X4)
54
55
★ : ATTENTION PIXEL

Fig.10


ELEMENT-RECOGNITION PROCESSING
S21
READ IMAGE DATA
S22
Y←0
S23
X←0
S24
ALL PIXELS ON THE FARTHEST LINES IN 7X7 BLOCK : OFF-PIXELS ?
NO
YES
S25
NUMBER OF ON-PIXELS WITHIN 5X5 BLOCK : 6 TO 10 ?
NO
YES
S26
EXAMINE ELEMENT-CANDIDATE SIZE
S27
OFF-PIXELS IN REFERENCE BLOCK CORRESPONDING TO ELEMENT-CANDIDATE SIZE ?
NO
YES
S28
SET ELEMENT FLAG
S30
ELEMENT FLAG ISN'T SET
S29
FINAL PIXEL IN X-DIRECTION ?
YES
NO
S31
X←X+1
S32
FINAL PIXEL IN Y-DIRECTION ?
YES
NO
S33
Y←Y+1
RETURN

TOSHIBA 6E0T1860

Fig.11

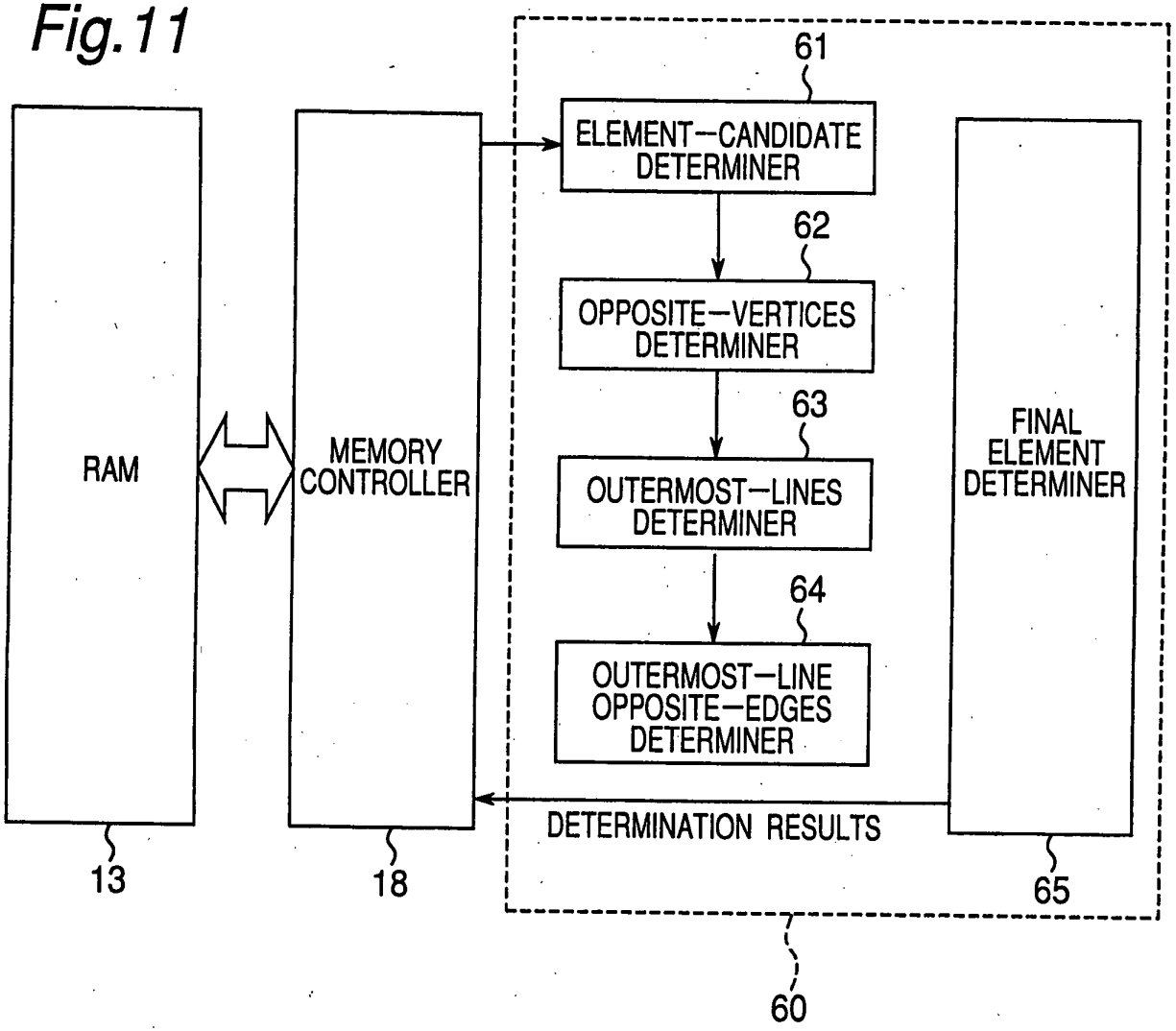
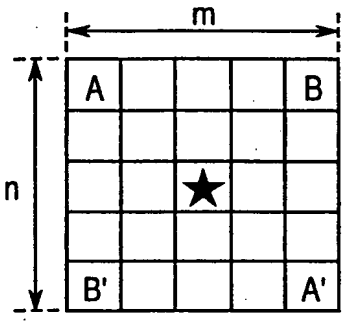


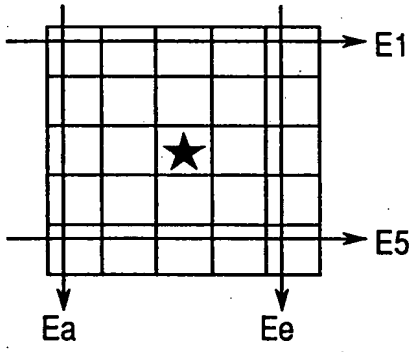
Fig.12



CONDITION { A+A'<2, B+B'<2

★ : ATTENTION PIXEL

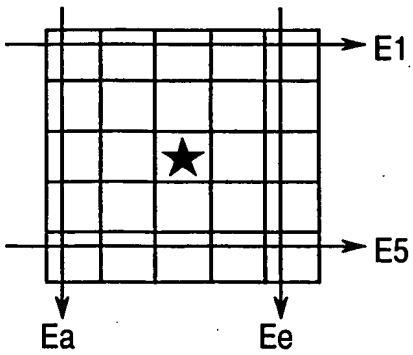
Fig.13



CONDITION { E1≦4, E5≦4, Ea≦4, Ee≦4

★ : ATTENTION PIXEL

Fig.14



CONDITION { E1+E5≦5, Ea+Ee≦5

★ : ATTENTION PIXEL

Fig.15

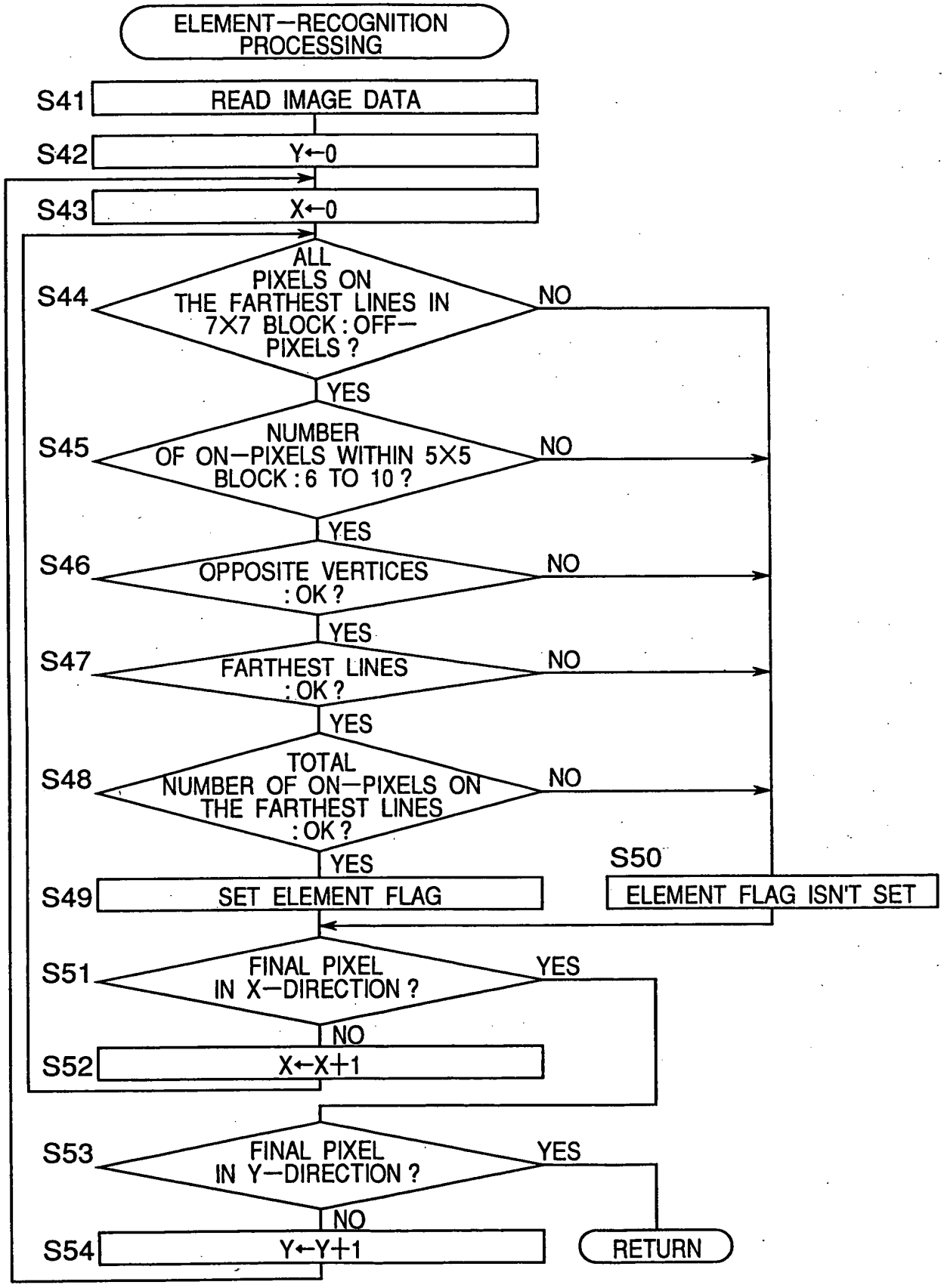
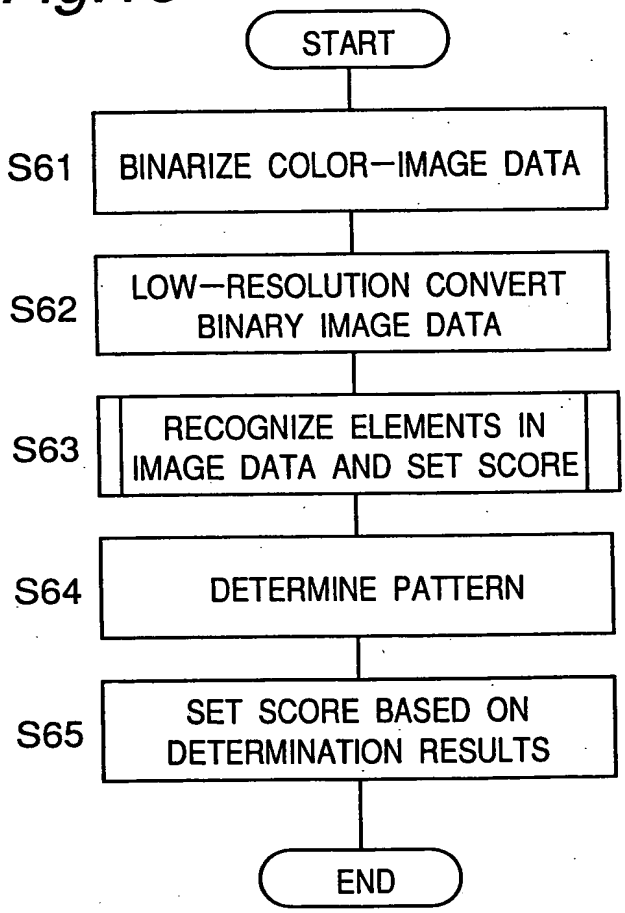

ELEMENT-RECOGNITION PROCESSING
S41
READ IMAGE DATA
S42
Y←0
S43
X←0
S44
ALL PIXELS ON THE FARTHEST LINES IN 7X7 BLOCK : OFF-PIXELS ?
NO
YES
S45
NUMBER OF ON-PIXELS WITHIN 5X5 BLOCK : 6 TO 10 ?
NO
YES
S46
OPPOSITE VERTICES : OK ?
NO
YES
S47
FARTHEST LINES : OK ?
NO
YES
S48
TOTAL NUMBER OF ON-PIXELS ON THE FARTHEST LINES : OK ?
NO
YES
S49
SET ELEMENT FLAG
S50
ELEMENT FLAG ISN'T SET
S51
FINAL PIXEL IN X-DIRECTION ?
YES
NO
S52
X←X+1
S53
FINAL PIXEL IN Y-DIRECTION ?
YES
NO
S54
Y←Y+1
RETURN

Fig.16


START
S61
BINARIZE COLOR—IMAGE DATA
S62
LOW—RESOLUTION CONVERT BINARY IMAGE DATA
S63
RECOGNIZE ELEMENTS IN IMAGE DATA AND SET SCORE
S64
DETERMINE PATTERN
S65
SET SCORE BASED ON DETERMINATION RESULTS
END

TOSHIBA 6E0FA860

Fig.17

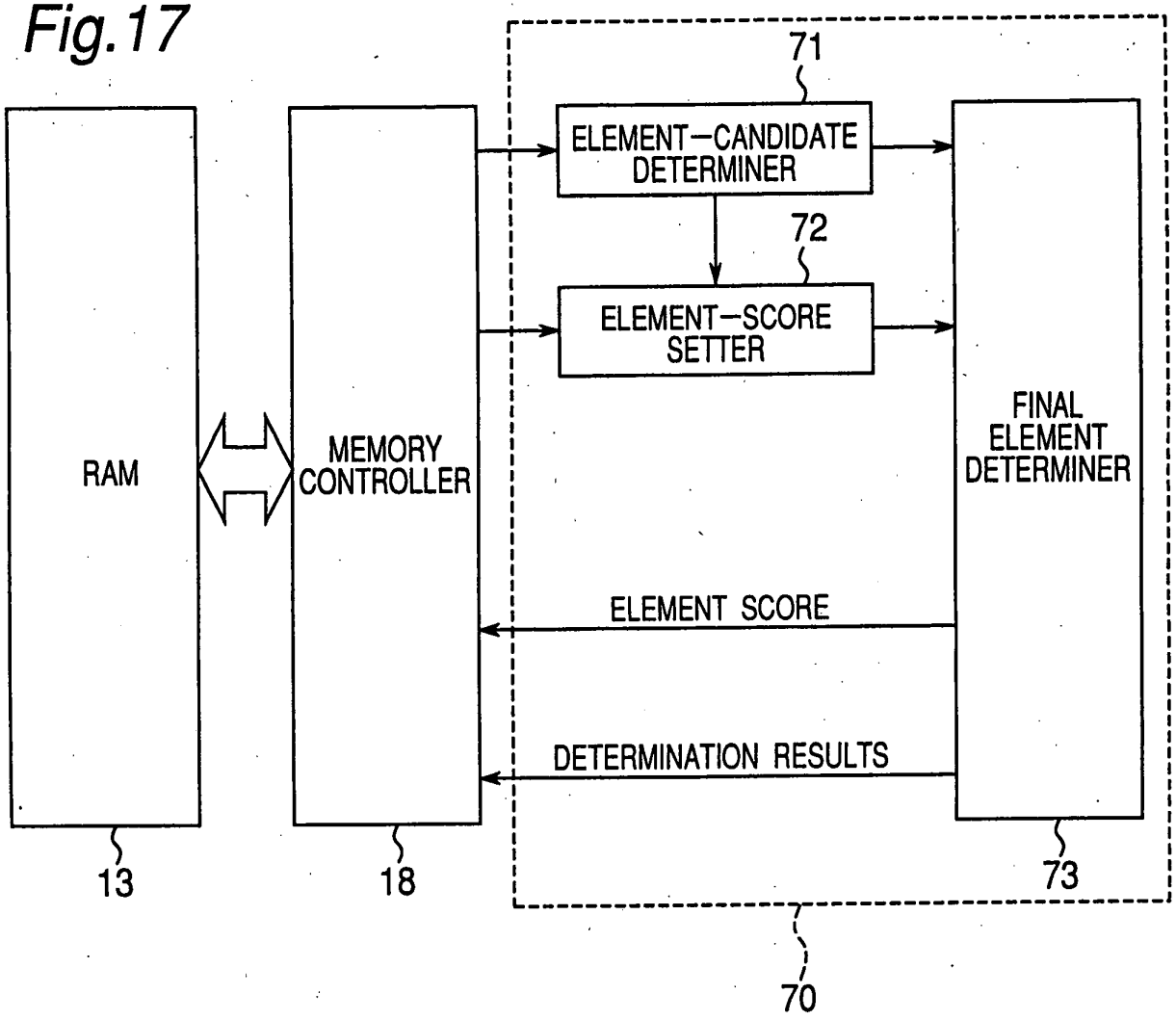


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Fig.18

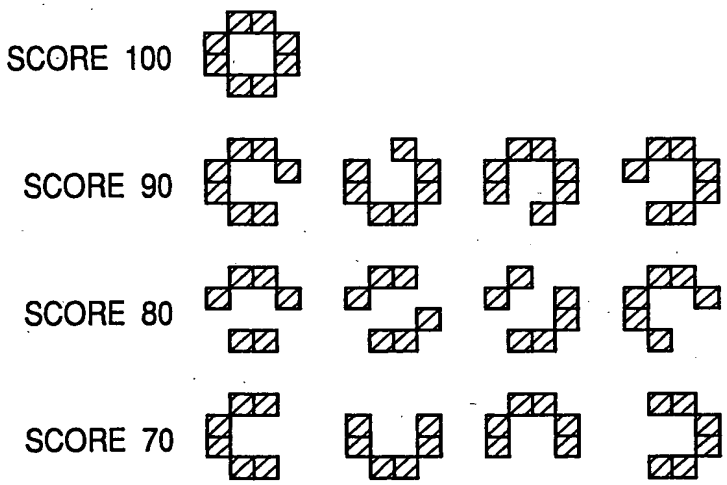


Fig.19

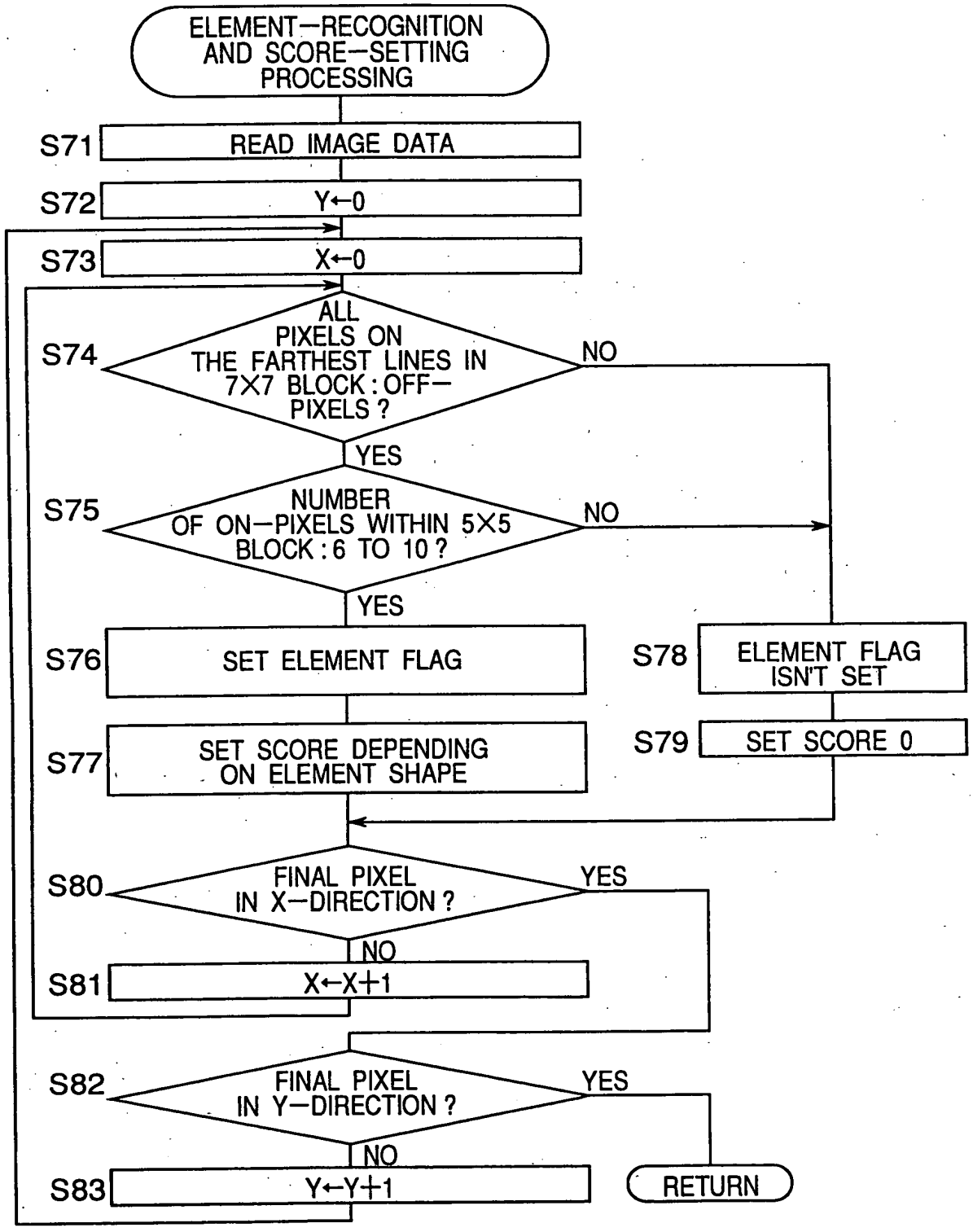

ELEMENT-RECOGNITION AND SCORE-SETTING PROCESSING
S71
READ IMAGE DATA
S72
Y←0
S73
X←0
S74
ALL PIXELS ON THE FARTHEST LINES IN 7X7 BLOCK : OFF-PIXELS ?
NO
YES
S75
NUMBER OF ON-PIXELS WITHIN 5X5 BLOCK : 6 TO 10 ?
NO
YES
S76
SET ELEMENT FLAG
S78
ELEMENT FLAG ISN'T SET
S77
SET SCORE DEPENDING ON ELEMENT SHAPE
S79
SET SCORE 0
S80
FINAL PIXEL IN X-DIRECTION ?
YES
NO
S81
X←X+1
S82
FINAL PIXEL IN Y-DIRECTION ?
YES
NO
S83
Y←Y+1
RETURN

Fig.20

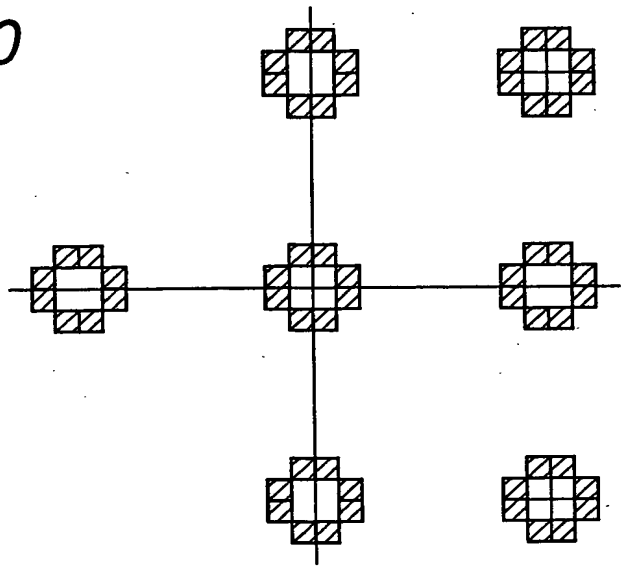
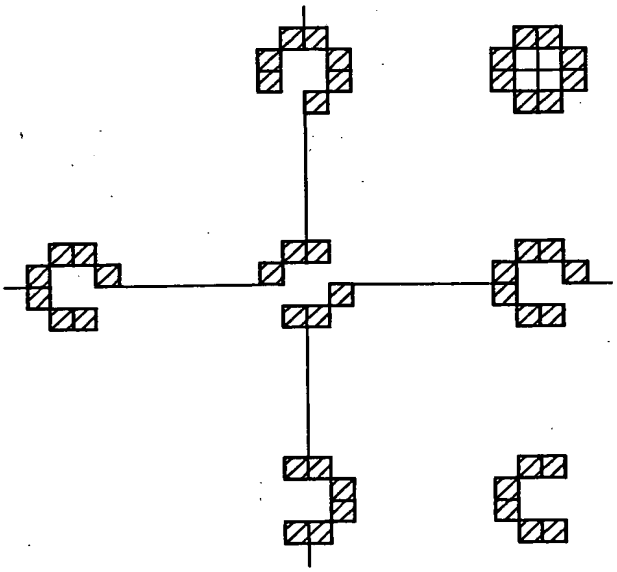
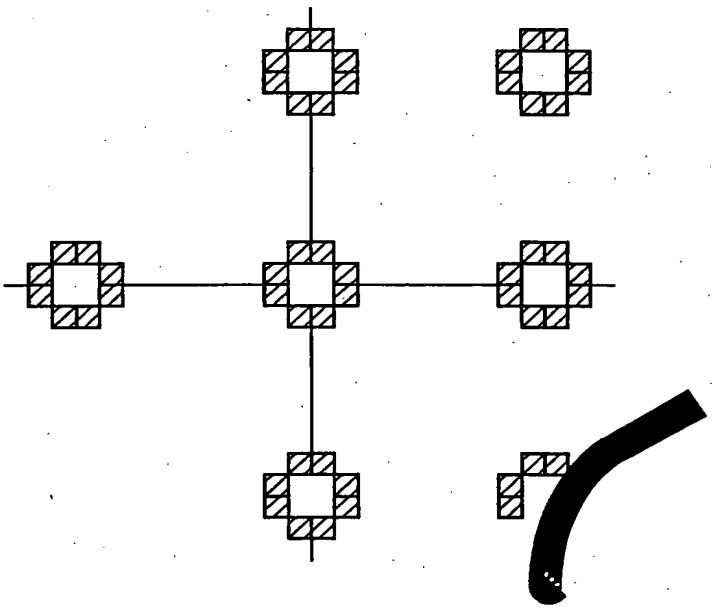


Fig.21



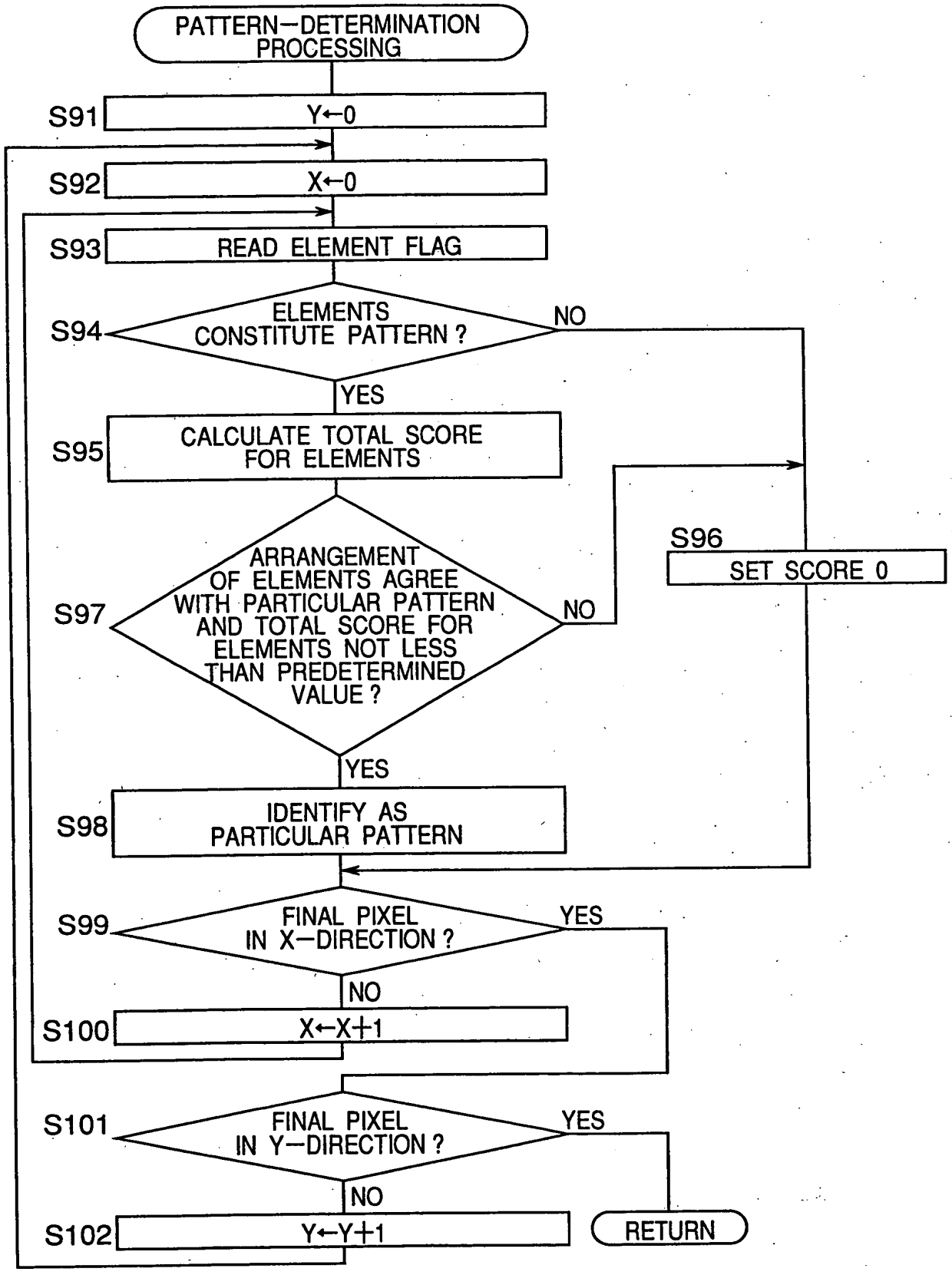
TOTAL SCORE : 520
SCORE 100X1
SCORE 90X3
SCORE 80X1
SCORE 70X2

Fig.22



TOTAL SCORE : 600
SCORE 100X6
SCORE 0X1

Fig.23


PATTERN-DETERMINATION PROCESSING
S91
Y←0
S92
X←0
S93
READ ELEMENT FLAG
S94
ELEMENTS CONSTITUTE PATTERN ?
NO
YES
S95
CALCULATE TOTAL SCORE FOR ELEMENTS
S96
SET SCORE 0
S97
ARRANGEMENT OF ELEMENTS AGREE WITH PARTICULAR PATTERN AND TOTAL SCORE FOR ELEMENTS NOT LESS THAN PREDETERMINED VALUE ?
NO
YES
S98
IDENTIFY AS PARTICULAR PATTERN
S99
FINAL PIXEL IN X-DIRECTION ?
YES
NO
S100
X←X+1
S101
FINAL PIXEL IN Y-DIRECTION ?
YES
NO
S102
Y←Y+1
RETURN